

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1 1. (Currently Amended) A wafer polishing head for polishing a semiconductor wafer on
2 a polishing pad, said polishing head comprising:
3 a housing including an upper housing portion;
4 a retaining ring having an interior cylindrical surface and defining an interior cylindrical
5 pocket sized to carry said wafer and to laterally restrain movement of said wafer when said wafer is
6 moved relative to said polishing pad while being polished against said polishing pad;
7 a wafer subcarrier attached to said retaining ring by a primary diaphragm and to said housing
8 by a secondary diaphragm;
9 a resilient pneumatic annular sealing bladder coupled for fluid communication to a first
10 pressurized pneumatic fluid to define a first pneumatic zone and attached to a first surface of a said
11 wafer stop plate adjacent said retaining ring interior cylindrical surface to receive said wafer and to
12 support said wafer at a peripheral edge;
13 said resilient pneumatic annular sealing bladder defining a second pneumatic zone radially
14 interior to said first pneumatic zone and extending between said first surface of said wafer stop plate
15 and said wafer when said wafer is attached to said polishing head during a polishing operation and
16 coupled for fluid communication to a second pressurized pneumatic fluid, said first surface of said
17 wafer stop plate not being in contact with a wafer back side surface during polishing of said wafer;
18 said wafer ~~attachment~~ stop plate operative during non polishing periods to prevent said wafer
19 from flexing excessively from an applied vacuum force used to hold said wafer to said polishing
20 head during wafer loading and unloading operations; and
21 said first and said pressurized fluids being adjusted to achieve a predetermined polishing
22 pressures over a front side surface of said wafer.
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2. (previously canceled) In a polishing machine, a method of applying air pressure to a retaining ring, sub-carrier, pneumatic bladder, and back side of wafer separately.

3. (previously canceled) In a polishing machine, a method of using a diaphragm supported from floating retaining ring.

4. (previously canceled) In a polishing machine, a method of using an open diaphragm support from floating retaining ring.

5. (previously canceled) A wafer polishing head for polishing a semiconductor wafer on a polishing pad, said polishing head comprising:

a retaining ring having an interior cylindrical surface and defining an interior cylindrical pocket sized to carry said wafer and to laterally restrain movement of said wafer when said wafer is moved relative to said polishing pad while being polished against said polishing pad;

a wafer attachment stop plate attached to said retaining ring;

a resilient pneumatic annular sealing bladder coupled for fluid communication to a first pressurized pneumatic fluid to define a first pneumatic zone and attached to a first surface of said wafer stop plate adjacent said retaining ring interior cylindrical surface to receive said wafer and to support said wafer at a peripheral edge;

said resilient pneumatic annular sealing bladder defining a second pneumatic zone radially interior to said first pneumatic zone and extending between said first surface of said wafer stop plate and said wafer when said wafer is attached to said polishing head during a polishing operation and coupled for fluid communication to a second pressurized pneumatic fluid, said first surface of said wafer stop plate not being in contact with a wafer back side surface during polishing of said wafer;

said wafer attachment stop plate operative during non polishing periods to prevent said wafer from flexing excessively from an applied vacuum force used to hold said wafer to said polishing head during wafer loading and unloading operations;

said first and said pressurized fluids being adjusted to achieve a predetermined polishing pressures over a front side surface of said wafer.

1 6. (previously canceled) A wafer polishing head for polishing a semiconductor wafer on
2 a polishing pad, said polishing head comprising:

3 a retaining ring having an interior cylindrical surface and defining an interior cylindrical
4 pocket sized to carry said wafer and to laterally restrain movement of said wafer when said wafer is
5 moved relative to said polishing pad while being polished against said polishing pad;

6 a wafer attachment stop plate attached to said retaining ring;

7 a resilient seal disposed adjacent said retaining ring interior cylindrical surface to receive said
8 wafer and to support said wafer at a peripheral edge and defining a first pneumatic zone when said
9 wafer has been mounted coupled for fluid communication to a first pressurized pneumatic fluid;

10 said wafer attachment stop plate operative during non polishing periods to prevent said wafer
11 from flexing excessively from an applied vacuum force used to hold said wafer to said polishing
12 head during wafer loading and unloading operations;

13 said first and said pressurized fluids being adjusted to achieve a predetermined polishing
14 pressures over a front side surface of said wafer.

1 7. (previously canceled) A wafer polishing head for polishing a semiconductor wafer on
2 a polishing pad, said polishing head comprising:

3 a retaining ring having an interior cylindrical surface and defining an interior cylindrical
4 pocket sized to carry said wafer and to laterally restrain movement of said wafer when said wafer is
5 moved relative to said polishing pad while being polished against said polishing pad;

6 a wafer attachment stop plate attached to said retaining ring;

7 a plurality of resilient pneumatic bladders attached to a first surface of said wafer stop plate,
8 each said bladder being coupled for fluid communication to a source of pressurized pneumatic fluid;

9 a first one of said plurality of resilient pneumatic bladders having an annular shape and
10 disposed adjacent said retaining ring interior cylindrical surface to receive said wafer and to support
11 said wafer at a peripheral edge, said first bladder being coupled for fluid communication to a first
12 pressurized pneumatic fluid;

13 a second one of said plurality of resilient pneumatic bladders disposed interior to said annular
14 shaped first bladder and coupled for fluid communication to a second pressurized pneumatic fluid;

15 said first and said pressurized fluids being adjusted to achieve a predetermined polishing
16 pressures over a front side surface of said wafer.

1 8. (previously canceled) A wafer polishing head for polishing a semiconductor wafer on
2 a polishing pad, said polishing head comprising:

3 a retaining ring having an interior cylindrical surface and defining an interior cylindrical
4 pocket sized to carry said wafer and to laterally restrain movement of said wafer when said wafer is
5 moved relative to said polishing pad while being polished against said polishing pad;

6 a wafer attachment stop plate attached to said retaining ring;

7 said wafer attachment stop plate having a plurality of resilient concentric annular sealing
8 ridges extending from a surface of said stop plate and defining independent pneumatic zones when
9 pressed against a back side surface of said wafer, each said pneumatic zone being coupled for fluid
10 communication to a source of pressurized pneumatic fluid;

11 a first one of said plurality of resilient concentric annular sealing ridges being disposed
12 adjacent said retaining ring interior cylindrical surface to receive said wafer and to support said wafer
13 at a peripheral edge and defining a first pneumatic zone, said first pneumatic zone being coupled for
14 fluid communication to a first pressurized pneumatic fluid;

15 a second one of said plurality of resilient concentric annular sealing ridges being disposed
16 interior to said first annular sealing ridges and coupled for fluid communication to a second
17 pressurized pneumatic fluid;

18 said first and said pressurized fluids being adjusted to achieve a predetermined polishing
19 pressures over a front side surface of said wafer.

1 9. (previously presented) A workpiece tooling head for polishing or planarizing a
2 workpiece on a polishing pad, said polishing head comprising:

3 a retaining ring having an interior cylindrical surface and defining an interior cylindrical
4 pocket sized to carry said workpiece and to laterally restrain movement of said workpiece when said
5 workpiece is moved relative to said polishing pad while being polished against said polishing pad,
6 said retaining ring having a lower surface that is pressed against said polishing pad by a first

7 pressurized fluid to define a first pressure zone of said retaining ring against said polishing pad
8 during polishing of said workpiece; and

9 a resilient seal disposed adjacent said retaining ring interior cylindrical surface to receive said
10 workpiece and to support said workpiece at a peripheral edge and defining a second pressure zone
11 between said workpiece and said polishing pad when said workpiece has been mounted to said head
12 that is coupled for fluid communication to a second pressurized fluid;

13 said first and said second pressurized fluids being adjusted to achieve a predetermined
14 polishing pressures over a front side surface of said workpiece.

1 10. (Currently Amended) A workpiece tooling head as in Claim 9, further comprising:
2 a workpiece attachment stop plate attached to said retaining ring;
3 said workpiece attachment stop plate operative during non-polishing periods to prevent said
4 workpiece from flexing an amount that would damage the structure of said workpiece from an
5 applied vacuum force used to hold said workpiece to said polishing head during workpiece loading
6 and unloading operations.

1 11. (previously presented) A workpiece tooling head as in Claim 9, wherein said
2 workpiece comprises a semiconductor wafer.

1 12. (previously presented) A workpiece tooling head as in Claim 9, wherein said
2 workpiece comprises a glass substrate.

1 13. (Currently Amended) A workpiece polishing head for polishing or planarizing a
2 workpiece on a polishing pad, said polishing head comprising:

3 a retaining ring having an interior cylindrical surface and defining an interior cylindrical
4 pocket sized to carry said workpiece and to laterally restrain movement of said workpiece when said
5 workpiece is moved relative to said polishing pad while being polished against said polishing pad,
6 said retaining ring having a lower surface that is pressed against said polishing pad by a first
7 pressurized fluid to define a first pressure zone of said retaining ring against said polishing pad

8 during polishing of said workpiece;

9 a workpiece attachment plate attached to said retaining ring for carrying said workpiece
10 during polishing, ; and said workpiece attachment plate having a plurality of resilient concentric
11 annular sealing ridges extending from a surface of said workpiece attachment plate and defining
12 substantially independent ~~pneumatic~~ pressure zones when pressed against a back side surface of said
13 workpiece, each said ~~pneumatic~~ pressure zone being coupled for fluid communication to a source of
14 pressurized ~~pneumatic~~ fluid;

15 a first one of said plurality of resilient concentric annular sealing ridges being disposed
16 adjacent said retaining ring interior cylindrical surface to receive said workpiece and to support said
17 workpiece proximate a peripheral edge and defining a second ~~pneumatic~~ pressure zone, said second
18 ~~pneumatic~~ pressure zone being coupled for fluid communication to a second pressurized ~~pneumatic~~
19 fluid;

20 a second one of said plurality of resilient concentric annular sealing ridges being disposed
21 interior to said first annular sealing ridges and coupled for fluid communication to a third pressurized
22 ~~pneumatic~~ fluid; and

23 said first, said second, and said third pressurized fluids being adjusted to achieve a
24 predetermined polishing pressure profile between said polishing pad and a front side surface of said
25 workpiece during polishing.

1 14. (Currently Amended) A workpiece polishing head as in claim 13, wherein said
2 workpiece attachment plate further includes a workpiece stop plate ~~is further~~ operative during non-
3 polishing periods to prevent said workpiece from flexing an amount that would damage the structure
4 of said workpiece from an applied vacuum force used to hold said workpiece to said polishing head
5 during workpiece loading and unloading operations.

1 15. (previously presented) A workpiece polishing head as in claim 13, wherein said
2 workpiece comprises a semiconductor wafer.

1 16. (Previously presented) A workpiece polishing head as in claim 13, wherein said
2 workpiece comprises a glass substrate.

1 17. (withdrawn) A method for processing a substrate having a front side surface and a
2 backside surface on a processing tool, said method comprising:

3 defining a first annular pressure zone with a first sealing member;

4 defining a second pressure zone radially interior to said first zone with a second sealing
5 member;

6 developing first and second pressures respectively in said first and said second pressure
7 zones;

8 contacting said backside surface of said substrate with said first and second sealing members
9 without an intervening structure so that said front side surface of said substrate is pressed against
10 said processing tool according to said defined first and second pressures; and

11 adjusting said first and second pressures to achieve a desired substrate material remove
12 characteristic across said front side surface of said substrate.

1 18. (withdrawn) The method in Claim 17, further comprising the steps of:

2 retaining said substrate within a cylindrical pocket defined by a retaining ring and sized to
3 carry said substrate and to laterally restrain movement of said substrate when said substrate is moved
4 relative to said processing tool during processing; and

5 defining an annular retaining ring pressure zone surrounding and substantially concentric
6 with said first annular pneumatic pressure zone to press a contact surface of a retaining ring against
7 said processing tool during processing.

1 19. (withdrawn) The method of Claim 18, wherein said annular retaining ring pressure
2 zone is defined to be a pressure that alters a substrate material removal rate proximate a peripheral
3 edge of said substrate to reduce under removal or over removal of material from a front side surface
4 of said substrate relative to interior portions of said substrate.

1 20. (withdrawn) The method in Claim 17, wherein said substrate material removal
2 comprises substantially uniform material removal across said front side surface of said substrate.

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1 21. (withdrawn) The method in Claim 17, wherein said substrate comprises a
2 semiconductor material.

1 22. (withdrawn) A semiconductor wafer made by the process in claim 17.

1 23. (Currently Amended) In a substrate planarization machine of the type having a
2 retaining ring for retaining the substrate to a substrate carrier during planarization against a polishing
3 pad, the ~~planarization~~ planarization machine characterized in that: a diaphragm mounts said substrate
4 and is supported from a floating retaining ring.

1 24. (Currently Amended) The substrate planarization machine in claim 2324, further
2 characterized in that said substrate is a substrate selected from the set of substrates consisting of a
3 glass material, a semiconductor material, a metallic material, and combinations thereof.

1 25. (previously presented) In a substrate processing machine of the type having a floating
2 retaining ring for retaining a substrate to a substrate carrier during processing against a material
3 removal tool, the processing machine characterized in that an open diaphragm supported from said
4 floating retaining ring presses said substrate against said material removal tool during said
5 processing while said retaining ring retains said substrate.

1 26. (New) In a polishing head, a method for holding and polishing a semiconductor
2 wafer on a polishing pad, said method comprising:

3 laterally restraining movement of said wafer with a retaining ring having an interior
4 cylindrical surface and defining an interior cylindrical pocket sized to fit said wafer when said wafer
5 is moved relative to said polishing pad while being polished against said polishing pad;

6 attaching a wafer subcarrier to said retaining ring by a primary diaphragm and to said housing
7 by a secondary diaphragm and carrying said wafer with said wafer subcarrier during polishing;

8 defining a first pneumatic zone with a resilient pneumatic annular sealing bladder coupled for

9 fluid communication to a first pressurized pneumatic fluid and attaching said sealing bladder to a
10 first surface of a wafer stop plate adjacent said retaining ring interior cylindrical surface to receive
11 said wafer and to support said wafer at a peripheral edge;

12 defining a second pneumatic zone with said resilient pneumatic annular sealing bladder
13 radially interior to said first pneumatic zone and extending between said first surface of said wafer
14 stop plate and said wafer when said wafer is attached to said polishing head during a polishing
15 operation and coupling the second pneumatic zone for fluid communication to a second pressurized
16 pneumatic fluid;

17 maintaining a non-contacting separation between said first surface of said wafer stop plate
18 and a wafer back side surface during polishing of said wafer, said wafer stop plate operative during
19 non-polishing periods to prevent said wafer from flexing excessively from an applied vacuum force
20 used to hold said wafer to said polishing head during a wafer loading and a wafer unloading
21 operation; and

22 adjusting said first and said pressurized fluids to achieve a predetermined polishing pressure
23 profile over a front side surface of said wafer.

1 27. (New) A semiconductor wafer made by the process in claim 26.

1 28. (New) A method of polishing or planarizing a workpiece on a polishing pad with a
2 polishing head, said method comprising:

3 laterally restraining movement of said wafer with a retaining ring having an interior
4 cylindrical surface and defining an interior cylindrical pocket sized to fit said wafer when said wafer
5 is moved relative to said polishing pad while being polished against said polishing pad;

6 pressing a lower surface of said retaining ring against said polishing pad by applying a first
7 pressurized fluid to define a first pressure zone of said retaining ring against said polishing pad
8 during polishing of said workpiece; and

9 receiving said workpiece and supporting said workpiece at a peripheral edge by defining a
10 second pressure zone between said workpiece and said polishing pad, said second pressure zone
11 being defined by providing a resilient seal disposed adjacent to said retaining ring interior cylindrical

12 surface that receives the workpiece;
13 coupling a first pressurized fluid to said first pressure zone and a second pressurized fluid to
14 said second pressure zone; and
15 adjusting said first and said second pressurized fluids to achieve a predetermined polishing
16 pressures over a front side surface of said workpiece.

1 29. (New) A method as in claim 28, wherein the workpiece comprises a
2 semiconductor wafer.

1 30. (New) A workpiece made by the process in claim 28.

1 31. (New) A semiconductor wafer made by the process in claim 30.

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